

### 3.5 Average Rate of Change Notes

#### VOCABULARY

The **average rate of change** of a function over an interval is the ratio of the difference (change) in  $y$  over the difference (change) in  $x$ .

$$\text{average rate of change} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

The line connecting the two points is called the **secant line**.

In other words, the average rate of change is the slope of the secant line.

#### Example 1:

Find the average rate of change for  $f(x) = 2\sqrt[3]{x+3}$  on the interval  $[-3, 5]$ .

Step 1: Evaluate the function for  $f(-3)$  and  $f(5)$ .

Step 2: Calculate slope between the two points from step 1 to find average rate of change.

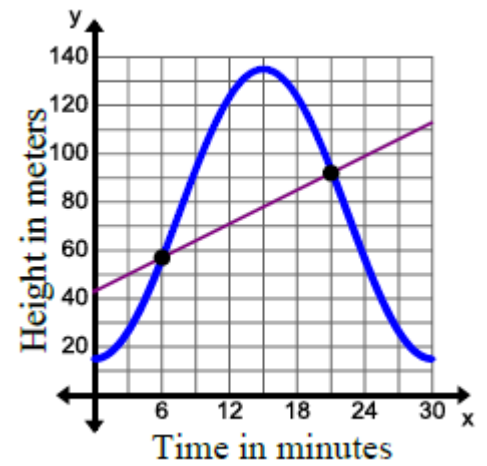
#### Example 2:

The table shows the total US farm exports in billions for several years. Find the average amount per year from 1996 to 2000.

Years	Amount (billions)
1980	41.2
1985	29.0
1990	39.5
1992	43.2
1993	42.9
1994	46.3
1995	56.3
1996	60.4
1997	57.2
1998	51.8
1999	48.5
2000	51.6

**Example 3:**

Jane is visiting London and took a ride on the London Eye. Her distance in meters from the ground at any given time is shown in the graph at the right. Find her average rate of change from 6 to 21 minutes.

**3.6 Average Rate of Change Assignment**

1. Find the average rate of change for  $f(x) = -3x^2 + 10x - 5$  on  $[-10, 8]$ .

2. Find the average rate of change for  $f(x) = \sqrt{x + 15} + 17$  on  $[34, 241]$ .

3. The average price of a movie ticket in North America is given in the table. Find the average rate of change from 1991 to 2003. Be sure to interpret the meaning of the average rate of change for full credit.

Year	1987	1991	1998	1999	2003	2007
Price (\$)	3.91	4.21	4.35	5.06	6.03	6.88

Find the average rate of change for each function on the specified interval.

4.  $f(x) = 3x^2 - x + 5$  on  $[1, 3]$

5.  $f(x) = -x^2 + 4$  on  $[3, a]$

6.  $f(x) = \frac{x^2 + 11x + 30}{x + 6}$  on  $[-4, 0]$

7.  $f(x) = \sqrt{x + 8} - 6$  on  $[-4, 0]$

8.  $f(x) = \sqrt[3]{x + 2} + 1$  on  $[-3, 6]$